

CLAIMS

Subpart 1
1 A magnetic recording medium comprising a nonmagnetic glass or silicon substrate having non-oriented irregularities on a surface thereof, and, having applied thereon in the following order:

5 an underlayer which comprises a second underlayer consisting of nickel and phosphorus and a third underlayer containing chromium as a principal component thereof which are formed in the described order, in the presence or absence of a first underlayer 10 containing chromium as a principal component thereof, on said substrate, and

15 a magnetic recording layer which has a circumferential direction of easy magnetization and contains cobalt as a principal component thereof, and also contains chromium and platinum in combination with tantalum or tantalum and niobium.

20 *Subpart 2*
2. The magnetic recording medium according to claim 1, in which said second underlayer has circumferentially distributed stripe-like ridges and grooves on a surface thereof.

25 3. The magnetic recording medium according to claim 2, in which said second underlayer has a surface roughness R_{a1} in a circumferential direction of less than 1 nm and a surface roughness R_{a2} in a radial direction of less than 2 nm, and the roughness R_{a1} is smaller than the roughness R_{a2} .

30 4. The magnetic recording medium according to claim 1, in which a ratio (wt%) of the nickel and phosphorus in the second underlayer is in the range of 67 to 85:33 to 15.

35 *Subpart 3*
5. The magnetic recording medium according to claim 1, in which said magnetic recording layer is constituted from a four-component metal alloy of cobalt, chromium, platinum and tantalum which is represented by the following formula:

Co_{bal.}-Cr₁₄₋₂₂-Pt₄₋₁₀-Ta_x

in which

~~bal. means a balance amount, and x is a in the range of 1 to 5 at%.~~

6. The magnetic recording medium according to claim 1, in which said magnetic recording layer is constituted from a five-component metal alloy of cobalt, chromium, platinum, tantalum and niobium which is represented by the following formula:

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~~Co_{bal.}-Cr₁₄₋₂₂-Pt₄₋₁₀-Ta_x-Nb_y~~

in which

bal. means a balance amount, and
a sum of x and y ($x + y$) is in the range of 1

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7. The magnetic recording medium according to claim 6, in which an amount of the added tantalum and that of the added niobium in the five-component alloy are exactly or substantially the same as each other.

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8. The magnetic recording medium according to claim 1, in which said magnetic recording layer has a tBr value (product of a layer thickness t of the magnetic recording layer and its residual magnetic flux density Br) of 40 to 180 G. μ m.

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9. The magnetic recording medium according to claim 1, in which said underlayer has a three-layered structure in which a thickness of the first underlayer is in the range of 5 to 25 nm, a thickness of the second underlayer is in the range of 10 to 200 nm, and a thickness of the third underlayer is in the range of 5 to 60 nm.

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10. The magnetic recording medium according to claim 1, in which said underlayer and said magnetic recording layer each is a thin layer formed by sputtering.

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11. The magnetic recording medium according to claim 10,

Subobj

~~in which said magnetic recording layer is a thin layer formed at a deposition temperature of 150 to 350°C upon sputtering.~~

5 ~~12. The magnetic recording medium according to claim 1, which further comprises, applied over said magnetic recording layer, a protective layer consisting of carbon or diamondlike carbon.~~

10 13. A magnetic recording disk device comprising a recording head section for recording in a magnetic recording medium and a reproducing head section for reproducing information, in which said magnetic recording medium comprises a nonmagnetic glass or silicon substrate having non-oriented irregularities on a surface thereof, and, having applied thereon in the following order:

15 an underlayer which comprises a second underlayer consisting of nickel and phosphorus and a third underlayer containing chromium as a principal component thereof which are formed in the described order, in the presence or absence of a first underlayer containing chromium as a principal component thereof, on said substrate, and

20 25 a magnetic recording layer which has a circumferential direction of easy magnetization and contains cobalt as a principal component thereof, and also contains chromium and platinum in combination with tantalum or tantalum and niobium; and

30 said reproducing head section is provided with a magnetoresistive head.

14. The magnetic recording disk device according to claim 13, in which said magnetoresistive head is a MR head, an AMR head or a GMR head.

35 15. The magnetic recording disk device according to claim 14, in which said magnetoresistive head is disposed on a stiction-free slider which is provided with rails for creating a flying force in its surface to be opposed to said magnetic recording medium and in which slider said rails have applied on a flying surface thereof two

or more protrusions, and in which said magnetic recording medium has a surface roughness R_a of 6 to 40 \AA .